



OFFSHORE PETROLEUM DISCHARGE SYSTEM (OPDS) UPDATE

JLOTS R&D Symposium VI

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PMS 325A
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OPDS Mission Requirements

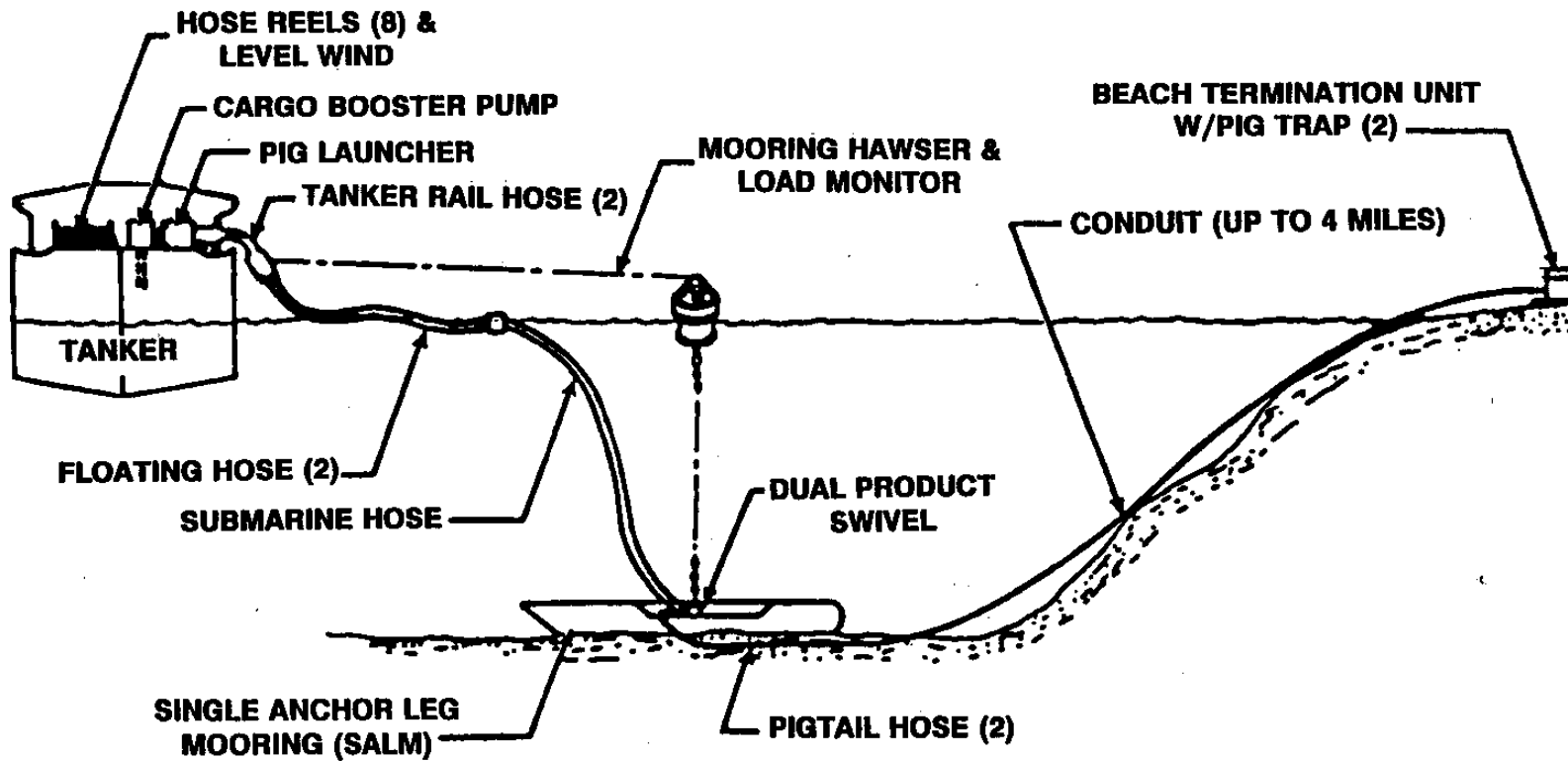


- ◆ PROVIDE TIMELY DELIVERY OF PETROLEUM PRODUCTS FROM AN OFFSHORE TANKER TO FORCES ASHORE WHERE PORT OR TERMINAL FACILITIES ARE DAMAGED OR NON-EXISTANT
- ◆ PROVIDE FUEL FROM UP TO 4 MILES OFFSHORE TO THE HIGH WATER MARK TO SUPPORT FORCES ASHORE
- ◆ ABILITY TO PUMP PRODUCT WITHIN 48 HOURS OF ARRIVAL
- ◆ ABILITY TO PUMP UP TO 1.2 MILLION GALLONS OF PRODUCT PER DAY
- ◆ ABILITY TO ACHIEVE FULL SYSTEM OPERABILITY IN 7 DAYS
- ◆ CAPABILITY TO DEPLOY SYSTEM IN SEA STATES UP TO SEA STATE 3 (SS3)

SS CHESAPEAKE with OUBs



Typical Installation (on the SALM)



SS CHESAPEAKE (OPDS 3)



OPDS 3 CHESAPEAKE

IMPROVED MOORING SYSTEM (IMS)



IMS Study Initiated 6/98

→ Improved 4-Point Moor System Capabilities

- Improved holding power
- Smaller, Lighter Components for Navy Installation
- Independent Quick Release for Ship

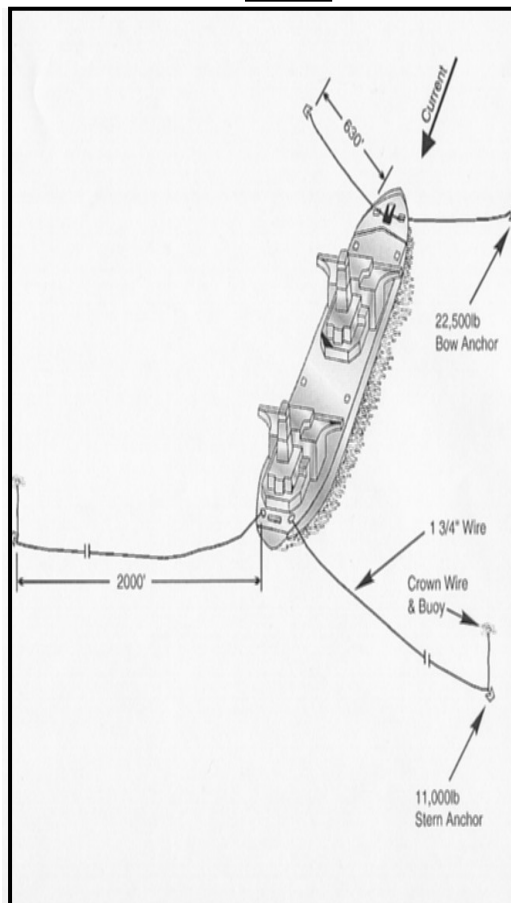
□ Multi-Point Moor (potential to eliminate SALM)

- Wider Site Selection
 - Shallower Depths Required for Ship
 - Greater Allowable Bottom Gradient
 - Fewer Potential Bottom Hazards
- Faster Installation
 - Fewer Weather Constraints
 - No Heeling Ship

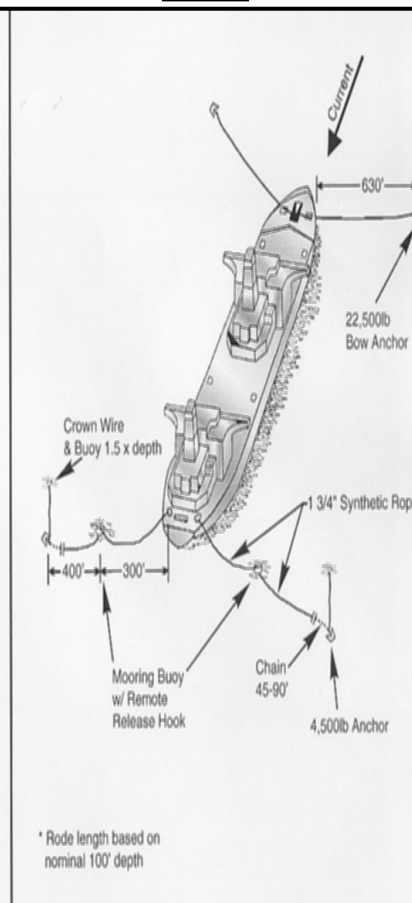
Improved Mooring System (IMS) Concepts



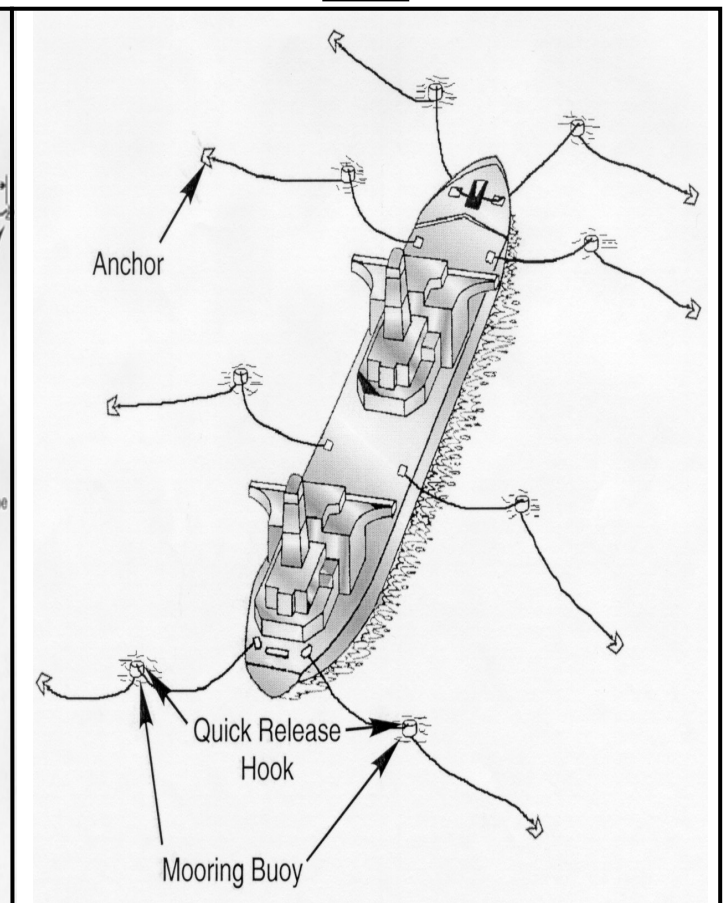
Four Point Moor



Improved Four Point Moor



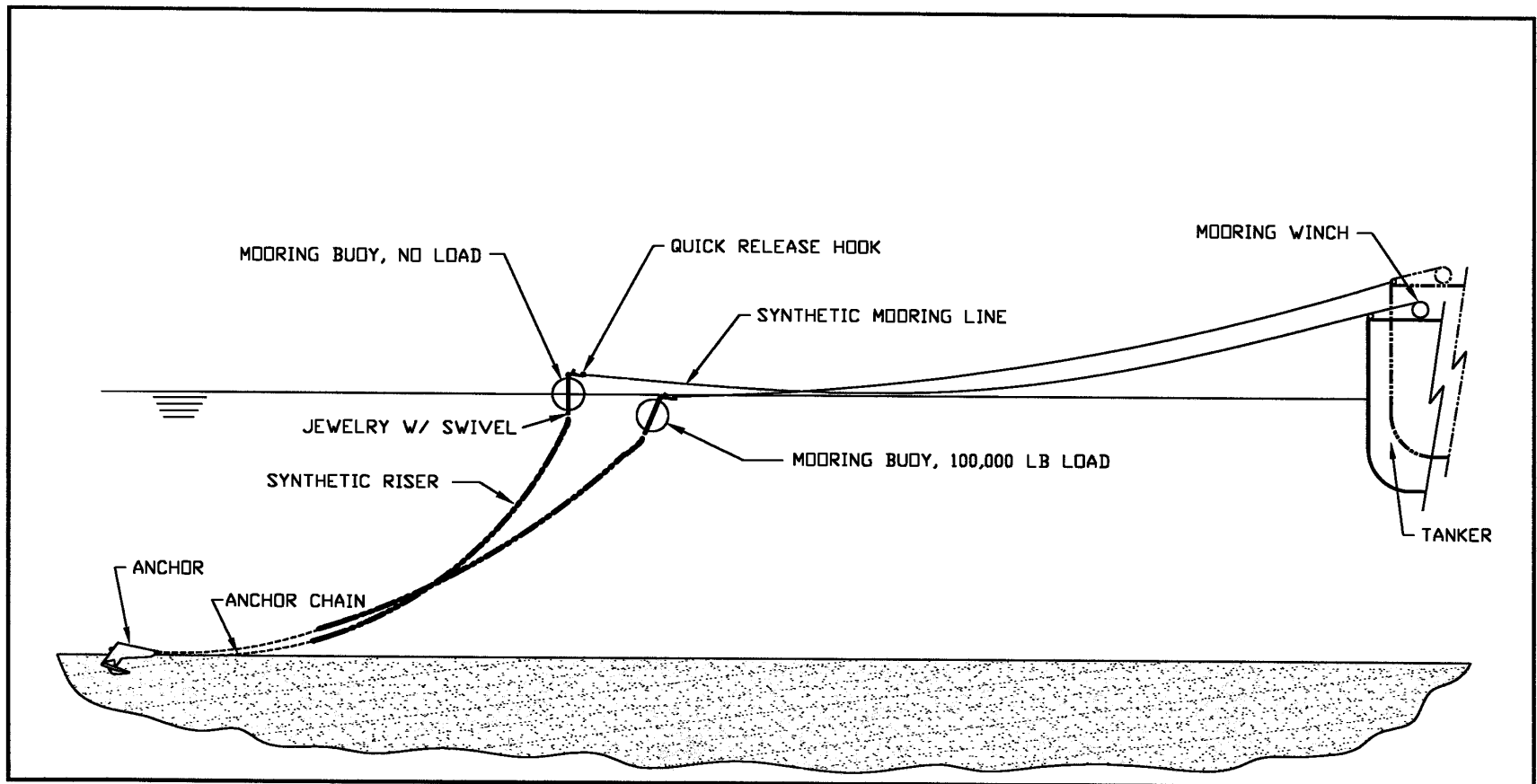
Eight Point Moor



MOORING LEGS



Mooring Leg Geometry



IMS Demonstration (11/99)



◆ Achievements

- ✓ Test installation with SS CHESAPEAKE at Coronado by AC1, ACB2, EWTGPAC and Ship's Crew personnel
- ✓ Proved Deployment Process
- ✓ Proved Anchor Capabilities
- ✓ Proved Quick Disconnect
- ✓ Proved Mooring Re-establishment Operation

◆ Shortfalls

- ✓ Mooring Line Selection (Mooring Master D7)
- ✓ Ship Interfaces

Mooring Line Selection



◆ Factors Considered

→ Commercial-off-the shelf

- ▣ Weight, float
- ▣ Suitable on Capstans? Winches?
- ▣ Low stretch, keep ship on station
- ▣ Reduced snap-back, safety issue

Mooring Line Selection Products Considered



ROPE DESCRIPTOR	FIBER	CONSTRUC TION	PROTECTIVE JACKET	FLOAT	FRICTION	TEMPERA- TURE SENSITIVITY	CAPSTAN & BITT	WINCH	USES & COMMENTS
AMSTEEL BLUE	UHMWPE SPECTRA	12- TWISTED STRANDS BRAIDED	NO	YES	LOW	HIGH	NO	YES	CHEVRON LIGHTERING 7+ YEARS USED ON A WINCH
PLASMA 12 STRAND	— UHMWPE SPECTRA	12- TWISTED STRANDS BRAIDED	NO	YES	LOW	HIGH	NO	YES	ASSIST TUG HAWSERS; USN DEEP SEA RESEARCH
PLASMA 12 X 12	UHMWPE SPECTRA	12 X 12 BRAIDED	NO	YES	LOW	HIGH	NO	YES	ASSIST TUG HAWSERS
VECTRAN 12 X 12	VECTRAN	12 X 12 BRAIDED	NO	NO	MODER- ATE	MODER- ATE	YES	YES	LIMITED MARINE USE TO DATE
VETS 335 PER CID A-A-54035	UHMWPE SPECTRA	4 TWISTED STRANDS, WIRE LAYED	YES **	YES	HIGH	MODER- ATE	YES	YES	NAVY USES IN LIEU OF ARAMID FOR SINGLE PART MOORING
VETS 335 PER CID A-A-54035	ARAMID/ KEVLAR	4 TWISTED STRANDS, WIRE LAYED	YES **	NO	HIGH	LOW	YES	YES	USN NAVY MOORING LINE; MAY BE PHASED IN FAVOR OF SPECTRA

** JACKET IS ON INDIVIDUAL STRANDS, AND COMPRISED OF A POLYESTER AND KEVLAR BLEND

Mooring Line Selection

(Continued)



◆ Plasma 12x12 – 2-inch Diameter

- ✓ All Spectra Material
- ✓ 12x12 Braid
- ✓ Best Suited for Winch Applications

◆ VETS 335 – 2-3/8-inch Diameter

- Four Individual Strands (Twisted Construction similar to wire rope)
 - ✓ Spectra Core Material
 - ✓ Polyester / Kevlar Jacket
 - ✓ Best Suited for Bitts and Capstans

IMS Implementation

Improved 4-point Moor



◆ STERN

- ✓ Use existing winches with mods
- ✓ Replace Existing Stern Anchors and Wires with new anchors, buoy systems and lines
 - Plasma 12x12 – 2-inch Diameter
- ✓ Replace Smith-Berger Fairleads with Chocks

◆ BOW

- ✓ Use existing capstans, refurbish chocks
 - Could upgrade by installing 2 new winches/chocks
- ✓ Add new anchors, buoy systems and lines
 - VETS 335 – 2-3/8-inch Diameter

IMS Implementation Interim 8-point Moor



- ◆ Install Bow and Stern improved 4 point
- ◆ Refurbish existing Beam capstans, bitts, chocks (2 port, 2 stbd)
- ◆ Add new Beam leg anchors, buoy systems and lines

IMS Implementation

Complete IMS Installation



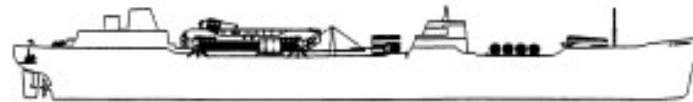
- ◆ Install modifications needed for Interim 8-point with beam leg winches instead of capstans (2 port, 2 stbd)
- ◆ SALM Removal (to be determined)

STATUS



- ◆ SS CHESAPEAKE demonstrated "improved" 4-point mooring system during Turbo Patriot 00 (Sept. 00)
 - Existing winches aft with Spectra 12x12 line
 - Smith-Burger Fairlead replaced with chocks
 - Refurbished Capstans/Bitts/Chocks forward with VETS 335 line
- ◆ Working with N42 and MARAD on implementation plans for Improved 4-Point Moor on PETERSBURG and MT WASHINGTON
- ◆ Proposed that FY01 exercise focus on Improved 4-Point Moor on arrival to deploy conduit, begin pumping and deploy SALM. Return to mooring for recovery of SALM could be based on conditions.

OPDS TANKERS



OPDS 5 - SS MOUNT WASHINGTON



OPDS 3 & 4 - SS CHESAPEAKE & SS PETERSBURG



OPDS 2 - SS AMERICAN OSPREY



OPDS 1 - SS POTOMAC

	OPDS-1	OPDS-2	OPDS-3	OPDS-4	OPDS-5
COMPLETED	1985	1988	1991	1994	1996
LENGTH (FT)	820	861	736	736	736
BEAM (FT)	84	90	102	102	102
DRAFT (FT)	34	36	40	40	40
DWT (LTONS)	27,467	34,723	50,023	50,063	49,471
PRODUCT (BBL)	168,000	235,000	255,000	255,000	269,000

SS PETERSBURG (OPDS 4)



SS PETERSBURG

SALM



SINGLE ANCHOR LEG MOORING (SALM)

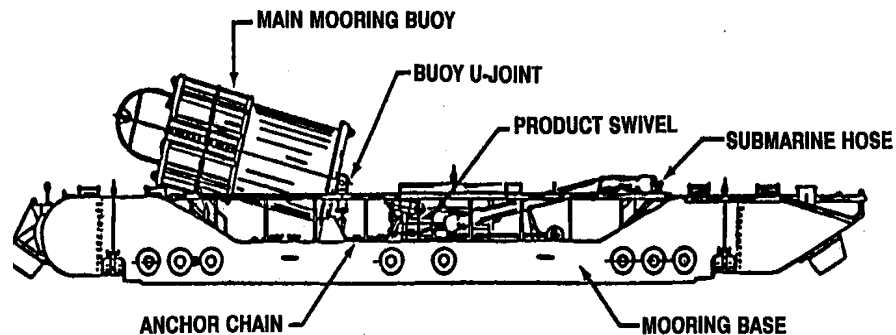
PROVIDES SINGLE POINT MOORING (SPM) FOR OPDS TANKER IN WATER DEPTHS OF 35ft TO 200ft UP TO AND INCLUDING SEA STATE 5 (SS5)

PROVIDES DUAL PRODUCT SWIVEL FOR PUMPING TWO PRODUCTS SIMULTANEOUSLY

SALM DIMENSIONS - LENGTH 150ft; WIDTH 57ft; WEIGHT 800 SHORT TONS WITH BUOYS

AUXILIARY BUOY - LENGTH 15ft; DIA 6ft 8inch; USED FOR DEPTHS OF 35ft TO 59ft

MAIN BUOY - LENGTH 30ft; DIA 14ft; USED FOR DEPTHS OF 60ft TO 200ft

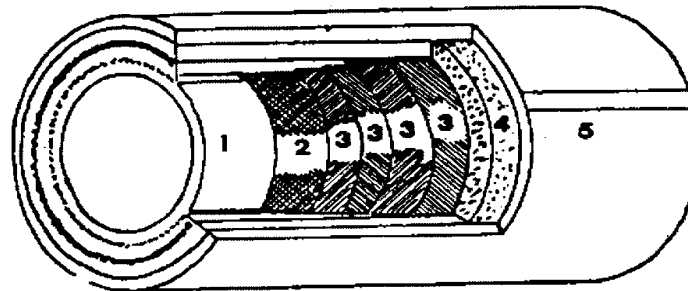


FLEXIBLE CONDUIT



OPDS FLEXIBLE CONDUIT

- EIGHT REELS OF FOUR OR SIX PLY FLEXIBLE CONDUIT PER SHIP
 - 1,014 FEET PER SECTION
 - THREE SECTIONS PER REEL
 - 24,336 FEET PER SHIPSET
- CHARACTERISTICS
 - SIX INCH INNER DIAMETER
 - 740 PSI MAXIMUM OPERATING PRESSURE
 - 1,125 PSI USCG HYDROSTATIC TEST PRESSURE
 - 2,220 PSI DESIGN BURST PRESSURE
 - 7,000 LBS TENSILE STRENGTH

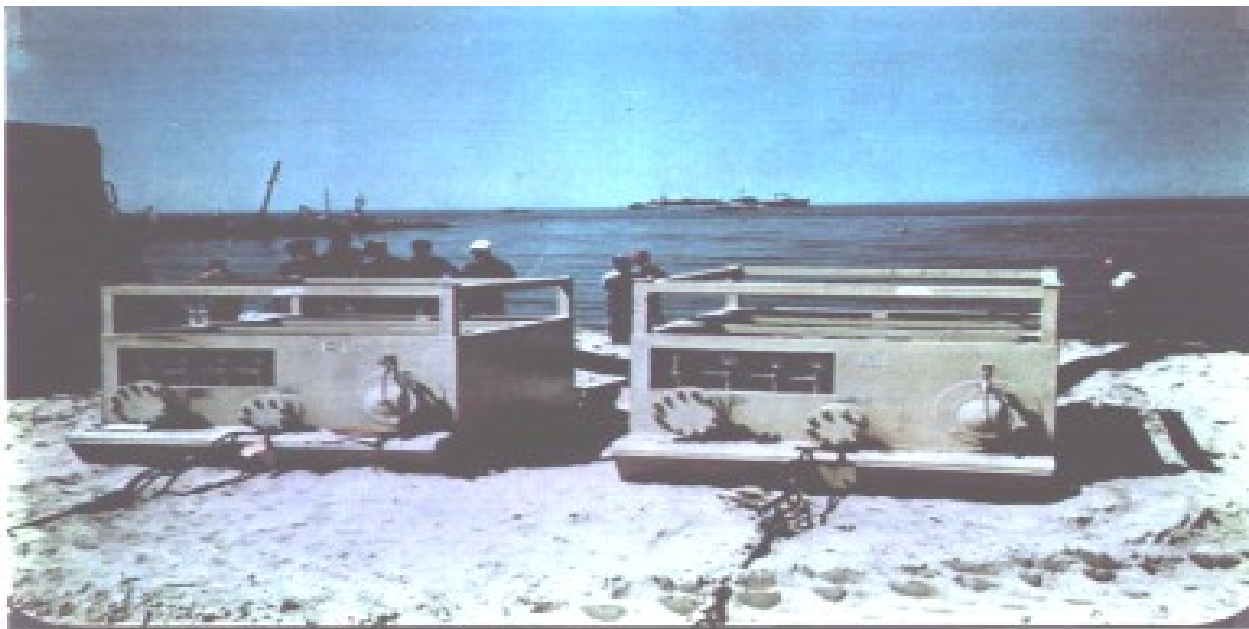


BTU



BEACH TERMINATION UNIT (BTU)

- TWO BTUs PER SHIP SET TO ALLOW TWO FLOW PATHS
- INTERFACE BETWEEN OPDS AND THE ARMY/MARINE CORPS INLAND DISTRIBUTION SYSTEMS (Connections and Pressure control)
- ANCHOR FOR THE SHORE END OF CONDUIT



BEACH TERMINATION UNITS INSTALLED

OPDS OUBs



- ◆ OUB SHIPSET: 3 Tow Tugs, 1 LRB, 1 Dive Boat
- ◆ TANKER CONVERSIONS TO CARRY AND DEPLOY OUBs
 - ✓ SS PETERSBURG completed and forward deployed with OUB's
 - ✓ SS CHESAPEAKE completed and is to be forward deployed in FY01
 - ✓ SS MT WASHINGTON conversion in planning
- ◆ THIRTEEN OUBs CONVERTED
 - ✓ 8 Tow Tugs (3 per ship, 2 for training)
 - ✓ 3 LRBs (1 per ship, 1 for training)
 - ✓ 2 Dive Boats (1 per ship)
- ◆ TWO OUB CONVERSIONS PLANNED TO COMPLETE TRAINING SET OF BOATS (ONE TOW TUG AND ONE DIVE BOAT)
- ◆ SS MT WASHINGTON TO USE TRAINING OUBs WHEN IT DEPLOYS

SS CHESAPEAKE with OUBs



OUB TOW TUG



OUB LRB



OUB DIVE BOAT

